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APPLICATIONS OF SATELLITE MICROWAVE OBSERVATIONS FOR A VERIFICATION OF REMO

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In order to investigate the hydrological cycle of the BALTEX-region, one of the main scientific aim of BALTEX, numerical models will be applied. Such models need, however, a careful verification. The goal of our work is to use satellite observations, in particularly those in the microwave spectral range, for a verification of the numerical results of REMO, one of the main models used for BALTEX. This verification will be done by the method of Newtonian iteration which was first used by Rodgers (1976) to retrieve temperature profiles from remote measurements of thermal radiation.

The output parameters of REMO (i.e. temperature and humidity profiles, surface wind, cloud water) are used as input for the radiative transfer model to calculate the miccrowave radiances at satellite level. These simulated temperatures are compared whith those measured by the Special Sensor Microwave/Imager (SSM/I) on the DMSP-satellites.

The Newtonian iteration is applied to minimize the differences between the observed and the calculated microwave radiances depending on the variation of the geophysical parameters. In our method we use only those geophysical parameters which contribute most to the microwave signal of SSM/I, e.g. total precipitable water, surface wind, liquid water content. These three modified parameters which describe the actual state of the atmosphere are compared with the original output of REMO to estimate its accuracy. For cloud free cases the problem is nearly linear and a solution is found after a few steps. Including cloudy situations the problem becomes nonlinear and more iteration-steps are required.

Calculations for May 1993 show that REMO overestimates total precipitable water by 1.7 kg/m^2 (Fig. 1) and underestimates surface wind speed by 1.2 m/s on average. REMO has problems calculating liquid water content. From these results and considering the widely used Bulk Parametrisation, where the evaporation E is a function of the mean wind speed and air-sea difference of the specific humidity, one can estimate that the mean evaporation should be about 18 W/m^2= 0.6 mm/day higher than calculated by REMO. The discovered discrepancies must have a large effect on the hydrological cycle as derived from REMO simulations.

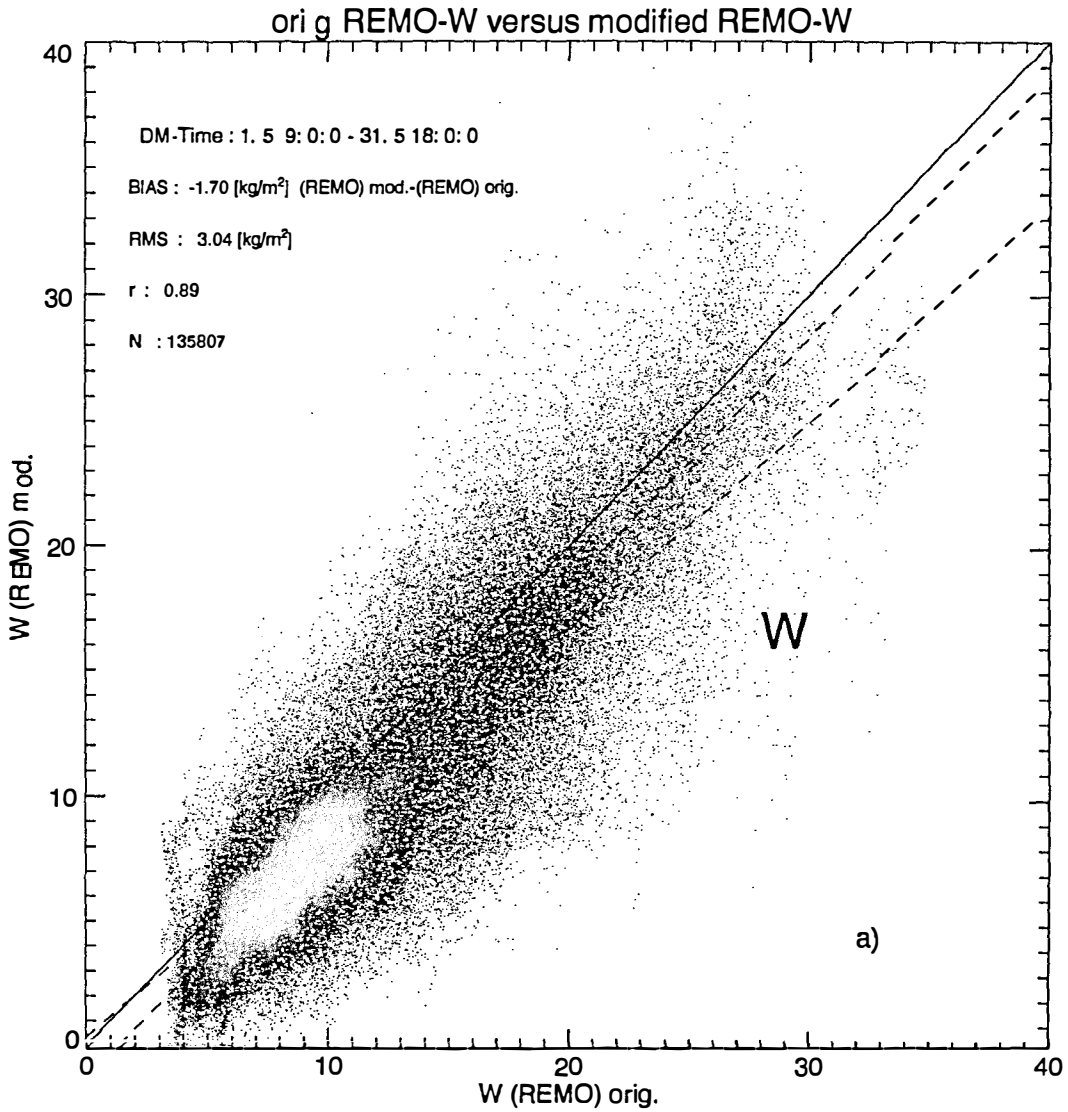

Figure 1: *Comparison of actual (x-axis) and modified (y-axis) REMO simulation of total precipitable water (May 1993).*

References

[1] **Rodgers**,C.D.;1976:
Retrieval of Atmospheric Temperature and Composition From Remote Measurements of Thermal Radiation. Reviews of Geophysics and Space Physics, Vol. 14, No. 4, 609-624.